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A STUDY OF THE HERPETOFAUNA
OF THE UAXACTUN-TIKAL AREA
OF NORTHERN EL PETEN, GUATEMALA

By L. C. Stuart

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INTRODUCTION

ALTHOUGH considerable herpetological material has, during the course of the past 125 years, been collected from the Yucatán Peninsula and from adjacent British Honduras and northern Guatemala at the base of the peninsula, very little of this has resulted from intensive studies carried on in any one locale. Furthermore, the herpetofauna of the transitional dry forests of interior southern Campeche, southern Quintana

Roo, and northern El Petén, Guatemala, have been known from only a handful of specimens. It was, therefore, with no hesitation that I accepted the invitation of my old friend Mr. Edwin M. Shook of the Carnegie Institution of Washington to accompany him to Tikal, El Petén, for the field season of 1956. Mr. Shook, who was on leave to the University Museum of the University of Pennsylvania, had been appointed to undertake the excavation and reconstruction of the famous Mayan ruins at Tikal. Because the first field season would be devoted to preliminary surveys, the erection of a permanent camp, and to cleaning the forest from the ruins, a rare opportunity for the study of the virgin forest presented itself.

Through the offices of Dr. Ralph A. Sawyer, Dean of the Horace H. Rackham School of Graduate Studies, University of Michigan, sufficient funds were made available to enable four biologists to initiate studies in the Tikal region. Accordingly, Dr. Theodore H. Hubbell and Dr. Irving J. Cantrall, entomologists, Mr. Paul Basch, conchologist, and the writer, all of the University of Michigan, were granted leave to undertake investigations. Our field season extended from early February through mid-May, 1956, and practically the entire period was spent at Tikal.

Little herpetological material from the Uaxactún-Tikal area has previously been known. Although the Swiss physician, Dr. Gustav Bernoulli, had collected some amphibians and reptiles in northern Guatemala and had visited Tikal in 1877, none of his specimens now in the Basel Museum bears Tikal data. In 1922 H. F. Loomis of the United States Department of Agriculture collected several specimens at Uaxactún during the course of an agricultural survey of northern Guatemala. His material is preserved in the collections of the United States National Museum. In 1927 Oliver Ricketson of the Carnegie Institution of Washington secured for the Museum of Comparative Zoology, Harvard College, a few snakes from the same locale. In 1931 Dr. Josselyn Van Tyne and Dr. Adolph Murie also visited Uaxactún in the course of an ornithological and mammalogical survey and collected some herpetological materials. These specimens, now in the collections of the Museum of Zoology, University of Michigan, were recorded in my preliminary study of the herpetofauna of the Petén (Stuart, 1934). Other amphibians and reptiles collected in the region were taken by a Mr. K. Gosner who visited Uaxactún in 1947 and 1949. His materials were subsequently turned over to the American Museum of Natural History. Finally, during the field season of 1957 Mr. Frank Smithe of New York secured further herpetological specimens at Tikal for the Museum of Comparative Zoology, Harvard College.

The following study is based upon 900 specimens. Of these, 775 were secured by me at Tikal and the remainder by the investigators noted above. These specimens are divided among 52 genera and 66 species and subspecies. Two species of turtles included in these totals are, however, not definitely known to occur in the region today. Although I believe the herpetofauna of the Uaxactún-Tikal area is somewhat depauperate, these figures suggest that further collecting will

reveal the presence of other forms in the region. The winter and spring of 1956 were unusually dry, and the rains, which normally can be expected about mid-May, did not come until a full month later. Although I made efforts to revisit Tikal in July and August, I was unable to do so, with the result that no wet-season studies of the region are available. On the other hand, a crew of 30 to 40 men who worked continually during the dry season cutting materials for buildings, clearing trails, and "bushing" the ruins secured rare treetop forms as well as a number of seldom-encountered ground species. Undoubtedly, a number of forms would have been missed had it not been for these intensive cleaning operations. This study might, indeed, be entitled "The Herpetofauna of One Square Kilometer of El Petén Forest."

Thus, although collections from the area are still incomplete, sufficient materials are now available to indicate the general nature of the herpetofauna and to locate it in the broader geographic picture of northern Central America. This account is presented, then, as a type-study of the herpetofauna of the dry forests of northern Guatemala, southern Campeche, and southern Quintana Roo.

Acknowledgments

I am indebted primarily, of course, to Mr. Edwin M. Shook for his courtesy in making available living quarters and laboratory space in the camp at Tikal. He was as interested in our biological work as in his own archeological studies, and he gave us the full co-operation of his crew. I also wish to acknowledge my gratitude to the various officials of the government of Colonel Carlos Castillo Armas, the late President of the Republic of Guatemala. An enthusiastic supporter of *Proyecto Tikal*, he personally saw that we were given *carte blanche* insofar as customs regulations and air transport within the country were concerned. Funds for the studies were made available through the Faculty Research Fund of the University of Michigan, largely, I suspect, on the recommendation and support of Dean Ralph A. Sawyer. Through the courtesy of Mr. Charles Bogert of the American Museum of Natural History and Dr. Ernest Williams and Mr. Benjamin Shreve of the Museum of Comparative Zoology, Harvard College, I have had the opportunity to utilize the collections from the Uaxactún-Tikal area in those institutions. Finally I wish to express my gratitude to my congenial companions in the field, Dr. Theodore H. Hubbell, Dr. Irving J. Cantrall, and Mr. Paul Basch, who took time during the course of their own studies to collect a large number of amphibians and reptiles, many of which proved to be rarities.

THE ENVIRONMENT

The Uaxactún-Tikal area as defined herein extends roughly from 17° 10' to 17° 30' N and from 89° 25' to 89° 45' W and encompasses some

1500 square kilometers. It may be described as the central portion of northeastern El Petén. Wadell (1938: 337) suggested parallel 17° N as the approximate boundary between the Yucatán Peninsula and Central America proper. This parallel coincides closely with a fault line that extends along the northern slopes of the Maya Mountains of Belize westward through Lake Yaxhá and Lake Macanché, along the northern shore of Lake Petén, and thence northwestward to the southern slope of the valley of the Río San Pedro Mártir. Thus the area is situated, physiographically, in the southeastern part of the Yucatán Peninsula.

Geology and Physiography

The entire southern and southwestern third of the Yucatán Peninsula (as defined by Wadell) lying south of the Sierra de Ticul of northern Yucatán (Sapper, 1937) is an elevated plateau attaining a maximum elevation of probably slightly more than 300 meters. This plateau is capped with Miocene limestones which apparently overlay gypsum strata of earlier Miocene age. In the south the plateau ends abruptly north of Lake Petén in a gypsum cliff that continues almost due west to Tabasco but which, to the east, curves north-northeastward into southern Quintana Roo. This cliff is easily visible from Temple IV at Tikal and it is one of the most conspicuous features of the landscape from that vantage point. The Uaxactún-Tikal area lies entirely to the east of this cliff.

According to Wadell (1938) the terrain east of the cliff has, through erosion, been stripped of its Miocene cap and now presents an Oligocene (Sapper, 1937) limestone surface which had been peneplained prior to the deposition of the gypsum beds. The Uaxactún-Tikal area is a rolling upland (maximum elevation about 300 m.; Tikal 283 m. and Uaxactún 207 m.), poorly drained for the most part, which shows frequent limestone outcroppings, and which is pitted with depressions of varying size. The smaller depressions, which may be only a few meters across, are always filled with water during the wet season but are frequently empty during the dry season. They appear to be plugged sinks and are known locally as *aguadas*. Larger depressions, which often cover many square kilometers, are also flooded during the wet season and, except for occasional *aguadas* within them, dry out during the summer (low sun) months. These large depressions are called *akalchés* (Mayan) or *bajos* (Spanish). In general, the streams in the area carry water only during the rains, although they may show as disjunct water holes during the dry season. The entire region is unquestionably in the mature stage of the karst cycle.

Although it is close to the divide between the Río San Pedro and the Río Azul drainage basins, the Uaxactún-Tikal area lies entirely within the Río Azul basin. The southern (Tikal) section is drained by several small, intermittent streams that enter the Bajo Santa Fé, which is in turn emptied by the Río Ixcán, a major tributary of the Azul. The northern (Uaxactún) section drains through the Bajo Juventud into the Río Uaxactún, likewise a major tributary of the Azul (Morley, 1938: 3).

Climate

Judging from data available for stations in the vicinity (presented by Page, 1938), the Uaxactún-Tikal area is probably subjected to a mean annual temperature of about 27° C. with a mean maximum (April or May) of about 30° and a mean minimum (December or January) of about 23°. Annual rainfall probably averages 1600 to 1800 mm. During the dry season, which extends from November through April, rainfall in the driest month (which is probably March) averages no more than about 30 mm. The wettest month appears to be September with about 300 mm. on the average, although there is a distinct tendency toward the development of two maxima with June as another very wet month.

Absolute maximum and minimum conditions cannot be given because records have been kept over a short period only. Not infrequently "northers" bring cool weather with temperatures as low as 15°. Early morning fogs are not unusual and even during the height of the dry season they often produce extremely humid conditions.

In general the climate may be characterized as truly tropical and at best only moderately moist. Moisture is extremely important in determining the nature of both flora and fauna. The region presents rainfall conditions that are intermediate between those of the outer end of the Yucatán Peninsula (which receives about 1000 mm. of precipitation annually) and the very wet base of the entire foreland (which, along the Verapaz foothills to the south, is subjected to over 5000 mm. of rainfall annually).

Vegetation

The area under consideration lies within the Northern Petén Phyto-geographic Province of Lundell (1934) and is classified as Tropical Dry Forest by Holdridge, Lamb, and Mason (1950). Viewed as a whole, the forest has been characterized by Lundell as a quasi-rain-forest type, luxuriant (maximum height of about 50 m.), semideciduous, and one in which the *zapote* (*Achras*) is the most conspicuous tree.

Bartlett (1935) presented a complete account of this forest on the basis of data secured in the Uaxactún-Tikal area. He recognized six major and fifteen minor associations in that general region. Holdridge, Lamb, and Mason (1950), viewing this forest in broader terms, recognized only "high forest" and "low forest," though they acknowledged that Bartlett's divisions are entities.

In general the high forest occurs on the well-drained uplands. It includes such minor associations as the *zapotal*, *ramonal*, *caobal*, and *cedral*, depending upon the dominant species of tree — in these instances *Achras*, *Brosimum*, *Swietenia*, and *Cedrela*, respectively. It is dominated by forest giants with the result that little light penetrates the heavy canopy and there is generally only sparse herbaceous growth on the forest floor. Shrubs, however, often occur in dense stands and a great variety of lianas are characteristic of understories. Forest litter varies from a thin layer of dried leaves to deep, almost mulchlike cover, and the rotting trunks of fallen trees are abundant.

The low forest occurs in the *akalchés*. The height of its canopy rarely exceeds 15 to 20 m. and considerable light penetrates to the forest floor. The trees are closely spaced and their branches frequently interlock. This condition, together with a profuse undergrowth of shrubs and lianas, renders passage impossible without the aid of a machete. Palms, especially the *escoba* (*Cryosophila*), are abundant. Generally flooded during the wet season to quagmire conditions, the *akalchés* or (*bajos*) dry out rapidly during the dry season, and xerophytic conditions, to which the flora is admirably adapted, obtain.

The vegetation surrounding the *aguadas* (which are scattered through both the low and the high forests) is much like that of the high forest, whereas within the *aguadas* there is frequently a heavy growth of water plants, tall sedges, and even hydrophile shrubs.

There can be no doubt that the forest of the region represents a condition of transition. To the north it shades gradually into the dry forests of the outer end of the Yucatán Peninsula (well described by Bequaert, 1933) and to the south into the wet forests lying south of the savannas of central El Petén (briefly discussed by Lundell, 1937).

THE HERPETOFAUNA

In giving an account of the herpetofauna of the Uaxactún-Tikal area four items must be considered:

1. The composition and nature of the herpetofauna.
2. The affinities of the herpetofauna.
3. The distribution of the herpetofauna within the area.
4. An account of the history of the herpetofauna based on these data.

It is unfortunate that too little is known to essay an account of the ecological relations of that herpetofauna with a view to understanding how it is sustained as an entity.

Composition and Nature of the Herpetofauna

The known herpetofauna of the Uaxactún-Tikal area consists of 64 forms distributed among the major amphibian and reptilian groups as in Table I (two doubtful turtles not included).

This is a small fauna indeed when compared with the total fauna of the Petén which currently is known to support 107 forms divided among 25 amphibians, 8 chelonians, 1 crocodilian, 32 saurians, and 41 serpents. To state on the basis of the little collecting that has been done in the region that the fauna of the Uaxactún-Tikal area is definitely depauperate, would probably be incorrect. Nevertheless, the poor representation of such genera as *Hyla*, *Sceloporus*, and *Kinosternon* and the absence of *Cnemidophorus* certainly indicate that the fauna is depauperate to some degree. On the other hand the known fauna of the area falls in line fairly well with that of the entire Petén when comparison of three major groups

TABLE I

Distribution of the Herpetofauna of the Uaxactún-Tikal Area

Group	Genera	Forms
Amphibia.	12	13
Chelonia	3	3
Crocodylia	1	1
Sauria	12	20
Serpentes	22	27
Total	50	64

is made. Assigning the amphibian species a rating of 1.0, the saurian and snake proportions would amount to 1.6 and 2.1, respectively. These figures compare favorably with 1.3 and 1.6 for the same groups occurring in the Petén as a whole.

Furthermore, in my opinion, such depauperization as may obtain can be readily explained by a consideration of the nature of the environment. First, the Uaxactún-Tikal area lies within a belt which is climatically and vegetationally transitional between the drier outer end of the Yucatán Peninsula to the north and the very humid base of the entire Central American foreland to the south, i.e., southern El Petén and northern Alta Verapaz.

Thus, the area is sufficiently dry to provide a suitable environment for such savanna and scrub-forest forms as:

Hypopachus cuneus nigroreticulatus
Anolis lemurinus bourgeaei
Anolis tropidonotus

Ameiva undulata gaigeae
Spilotes pullatus mexicanus
Oxybelis aeneus aeneus

On the other hand the region presents a forest habitat-type to a sufficient degree to preclude other savanna and scrub-forest forms. The following are conspicuous absentees of this class:

Bufo marinus
Tripurion petasatus
Anolis sericeus
Sceloporus chrysostictus

Sceloporus teapensis
Cnemidophorus sacki angusticeps
Masticophis mentovarius mentovarius
Conophis sp.

A number of forms that are most frequently associated with the forest habitat-type do occur within the region. Among these may be mentioned:

Gastrophryne elegans
Anolis biporcatus
Anolis humilis uniformis
Anolis pentapirion beckeri

Sceloporus lundelli lundelli
Xenodon mexicanus
Micrurus affinis alienus
Bothrops nasuta

Nevertheless the forest of the region is either too dry or not sufficiently luxurious to support several of the wet-forest forms that occur somewhat farther south such as:

Anolis capito
Eumeces sumichrasti
Ameiva festiva edwardsi

Rhadinaea decorata decorata
Bothrops nummifer mexicanus

A second factor that may contribute to depauperization of the fauna is the lack of environmental diversity. In the absence of altitudinal variations the region supports only a single vertical fauna, the lowlanders. Furthermore, there is a lack of cover diversity, since only the forest habitat-type occurs naturally within the area. Although a number of microhabitat-types are present, they are all typical of any forest region.

Therefore, though it is still too early to say definitely, there is an indication that, when considered in the light of the environment, the known herpetofauna of the Uaxactún-Tikal area may possibly be about as large as could be expected.

The herpetofauna of the region may be characterized as a small but not necessarily depauperate assemblage, which is well balanced in the proportional number of forms belonging to the major amphibian and reptilian groups, which lacks local endemism, and which is composed of typically lowland groups. In the first two features it is strongly reminiscent of the herpetofauna of the Southeastern Highlands of Guatemala which I have previously described and discussed (Stuart, 1954).

Faunal Affinities

In essaying an analysis of the position of the herpetofauna of the Uaxactún-Tikal area it is necessary to examine its relation to the herpetofauna of the lowlands of northern Caribbean Central America and southern México as a unit. This may best be accomplished by breaking the fauna down into four divisions based upon similarities in geographic range.

1. Forms that are wide-ranging throughout most of lowland Central America and southern Mexico, especially in the east. Of the 64 forms recorded from the area 19 (30 per cent of the total) belong to this group. The following are especially representative:

Bufo valliceps
Leptodactylus melanonotus
Smilisca baudini
Rana pipiens
Thecadactylus rapicaudus
Corythophanes cristatus

Constrictor constrictor imperator
Xenodon mexicanus
Drymobius margaritiferus margaritiferus
Leptodeira annulata polysticta
Sibon nebulata
Bothrops atrox asper

2. Forms that are somewhat more restricted in range than the preceding, but nevertheless widespread throughout the lowlands of northern Caribbean Central America (i.e., Honduras through southern México, including most of the Yucatán Peninsula). This group also includes 19 forms (30 per cent) represented by the following:

Rhinophrymus dorsalis
Syrrhophus leprus
Coleonyx elegans elegans
Anolis biporcatus
Anolis lemurinus bourgeaui
Corythophanes hernandezii

Tropidodipsas sartori sartori
Oxyrhopus petola aequifasciatus
Ficimia publicia publicia
Spilotes pullatus mexicanus
Crocodylus moreleti
Kinosternon leucostomum

3. Forms that are endemic or nearly endemic (and probably autochthonous as well) to the Petén Biotic Area of Stuart (1943) as redefined by Smith (1949). This area extends across the lowlands of eastern northern Central America from extreme southern Veracruz to Honduras, excluding the outer end of the Yucatán Peninsula. Here are included 18 forms (28 per cent) represented by:

Bolitoglossa moreleti
Gastrophryne elegans
Anolis humilis uniformis
Anolis pentaprion beckeri
Laemactus deborrei
Celestus rozellae

Scaphiodontophis carpicinctus
Coniophanes imperialis clavatus
Adelphicos quadrivirgatus visoninus
Sibon dimidiata dimidiata
Micrurus affinis alienus
Claudius angustatus

4. Forms that apparently have differentiated in the dry outer end of the Yucatán Peninsula, i.e., the Yucatecan Biotic Area of Smith (1949), and which, for the most part, reach their southern limits within or slightly south of the Uaxactún-Tikal area. There are only 8 such forms (12 per cent):

Hypobachus cuneus nigroreticulatus
Eumeces schwartzei
Ameiva undulata gaigeae
Ninia sebae morleyi

Elaphe triaspis triaspis
Coniophanes schmidtii
Tantilla canula
Tantilla moesta

In summarizing these data it may be noted that about 60 per cent of the herpetofauna of the Uaxactún-Tikal area is comprised of forms that are more or less wide-ranging throughout most of northern Central America. The remaining forms appear to be autochthonous to either the Yucatecan faunal area to the north or the Petén area to the south. Insofar as local endemism can be taken as an indicator, there is no evidence that a third faunal division lies between these two. Thus, though it displays affinities with both adjacent faunal areas, the region through northern El Petén, southern Yucatán, and southern Quintana Roo, as exemplified by the Uaxactún-Tikal area, appears to be typical of neither. By actual count 20 per cent of the forms endemic or nearly endemic to the Yucatecan faunal area occur in this region as opposed to about 60 per cent of the typically Petén forms.

Although the transitional nature of the environment of the Uaxactún-Tikal area may very well preclude many of the forms occurring to the north or to the south, certain companion species of forms that do occur within this transition belt are conspicuously absent. For example, *Ameiva undulata* subsp. is a companion form of both *Sceloporus cozumelae* of the Yucatecan faunal area and *Sceloporus teapensis* of the Petén, yet neither occurs in the Uaxactún-Tikal area. Similarly absent is *Ameiva festiva edwardsi*, a companion form of *Anolis humilis uniformis*; these last two are the most characteristic forms of the wet Petén forest to the south. Furthermore, the highly tolerant *Hyla picta* which ranges throughout northern Central America with the exception of outer Yucatán is a surprising absentee.

It may be concluded, therefore, that the Uaxactún-Tikal area lies not only within a vegetational transition belt but within a faunal transition area as well. Although the herpetofauna of the Uaxactún-Tikal area shows some affinity to that of the Yucatecan area, it appears to be more closely allied to that of the humid Petén.

Local Distribution of the Herpetofauna

In the course of my investigations of the herpetofauna of northern Central America I have found that reptiles and amphibians can be grouped into two broad ecological classes: (1) those which are most frequently associated with woodlands, and (2) those which may be considered savanna types. Exact definitions of these two habitat-types are difficult to formulate. As I have indicated elsewhere (Stuart, 1950), certain types of forests may present grassland conditions. This is certainly true of the scrub forests of the outer end of the Yucatán peninsula. In contrast, scrub forest in a savanna area may provide a suitable environment for certain moist-forest forms, a condition which obtains in the low forests scattered through the savannas of the Petén to the south of the Uaxactún-Tikal area. Within the region under discussion no instances of specificity to any particular forest type (*zapotal*, *caobal*, or *cedral*) were noted among the terrestrial amphibians and reptiles. In other words, only one major habitat-type, the forest, occurs in the region. The low forest (*akalché*) does, however, show a negative difference from the high forest of the uplands, for reptiles within the low forest were, in general, extremely scarce both with reference to species and to individuals. This I believe is probably the result of extensive flooding of the *akalchés* during the wet season, which precludes the presence of many species over much of the year. It is questionable whether many forms can survive as populations in these areas except during a period when inundation is reduced.

Despite the lack of diversity of major habitat-type in the region, a number of microhabitats can be recognized. The most conspicuous of these is the aquatic and aquatic-margin environment. In terms of area occupied this is, at best, a very minor environment. Only a few permanent *aguadas* lie within the area and such wet-season streams as occur

dwindle to isolated pools during the dry season. Nevertheless, these few wet areas and the flooded *akalchés* of the wet season have permitted invasion by and establishment of populations of a diversified, if not large, fauna of aquatic-breeding and aquatic-margin amphibians and reptiles. These include:

Rhinophrynus dorsalis
Bufo valliceps
Leptodactylus melanonotus
Agalychnis callidryas
Smilisca baudini
Hyla loquax
Hyla microcephala martini

Hypopachus cuneus nigroreticulatus
Gastrophryne elegans
Rana pipiens
Crocodylus moreleti
Kinosternon leucostomum
Claudius angustatus
Pseudemys scripta ornata

Of the above, *Bufo*, *Rhinophrynus*, *Leptodactylus*, *Smilisca*, *Hyla loquax*, *Agalychnis*, *Hypopachus*, and *Gastrophryne* often leave the *aguadas* during the dry season. They go into aestivation in the earth (*Rhinophrynus* and *Hypopachus* were frequently so observed), seek refuge in the moist mulch of the forest floor (*Smilisca* and *Gastrophryne*), or find protection in the fronds of palms or in holes in the palm trunks (*Agalychnis*, and *Hyla loquax*). The other amphibians and the crocodile and turtles listed above appear to remain in the *aguadas* if these retain water during the dry season. It is interesting to note that the only specimens of *Oxybelis aeneus aeneus* known from the region were found in tall grass and sedges and on the shrubs in and around the *aguada* at Tikal. I believe they were drawn to this habitat more by the scrubby nature of the vegetation (the normal habitat of this form) than by any affinity for humid conditions.

Within the forest proper four herpetofaunal microenvironments may be recognized: (1) the litter of the forest floor, (2) the surface of the forest floor, (3) the lower forest story (shrubs), and (4) the arboreal environment of the forest roof. In the litter and under stones and logs on the forest floor the following were secured:

Bolitoglossa moreleti
Eleutherodactylus rhodopis
Syrrhophus leprus
Scincella cherriei ixbaac
Adelphicos quadrivirgatus visoninus

Ninia sebae morleyi
Coniophanes imperialis clavatus
Tantilla canula
Tantilla moesta
Bothrops nasuta

One surprising feature of the region was the sparsity of reptiles and amphibians within or beneath rotting logs. My assistant and I tore apart a large number of logs but we secured few specimens therefrom. Even insects and insect larvae were only occasionally observed in this micro-environment.

The fauna of the surface of the forest floor is in many instances difficult to ascertain. Some forms which are probably litter forms during the day may be secured on the forest floor at night, e.g., *Coleonyx elegans elegans*, or may make only a brief appearance during the early

hours of the day to bask in the sun, for instance, *Scincella cherriei ixbaac*. Others, such as *Anolis lemurinus bourgeaei*, frequently leave the ground to cling to the trunks of trees at very low levels. The following, however, were the ground forms most commonly observed:

Anolis lemurinus bourgeaei
Anolis humilis uniformis
Anolis tropidonotus
Ameiva undulata gaigeae
Xenodon mexicanus

Drymobius margaritiferus margaritiferus
Spilotes pullatus mexicanus
Sibon nebulata
Micrurus affinis alienus
Bothrops atrox asper

The fauna of the shrub and lower tree-trunk story of the forest though not large is certainly distinctive. Only these five species appear to inhabit this environment or its equivalent:

Sphaerodactylus glaucus glaucus
Sphaerodactylus lineolatus
Anolis limifrons rodriguezi

Anolis ustus
Oxybelis aeneus aeneus
 (in *aguada* only)

But, as previously indicated, several species characteristic of the forest floor frequently move up onto the trunks of large trees or into the lower branches of shrubs to take advantage of sunlight or possibly to feed.

The strictly arboreal or treetop forms that may be expected in a forest of this height are generally rare in collections. In the course of the work at Tikal, however, a work crew of about 30 men spent several months cleaning the forest from the *Plaza Mayor* and cutting broad trails. During these cleaning operations the seldom-seen arboreal species were brought into easy reach. The great majority of these were secured by workmen. Since I was frequently working in other parts of the forest, I was not on hand when much of this material was collected. Nevertheless, of a series of 36 *Corythophanes* spp. secured at Tikal, 32 were taken between mid-March and mid-April when most of the felling was taking place. Similarly, all the specimens of *Anolis biporcatus* and *Imantodes cenchoa leucomelas* and the majority of the series of *Sibon nebulata* were secured during this period. This suggests that these forms are definitely associated with the upper levels of the forest. Of the arboreal reptiles in the area the following are the most representative:

Anolis biporcatus
Corythophanes cristatus
Corythophanes hernandezi
Leptodeira annulata polysticta

Imantodes cenchoa leucomelas
Sibon dimidiata dimidiata
Sibon nebulata

The foregoing data indicate that the herpetofauna of the Uaxactún-Tikal area is essentially a high-forest fauna. Certainly the presence of both a mulch fauna and an arboreal fauna and the sparsity of a savanna or scrub-forest fauna can lead to no other conclusion.

Origin of the Herpetofauna

It would be impossible to discuss in any detail the origin of the herpetofauna of the Uaxactún-Tikal region without giving considerable attention to the faunas of both the Yucatecan and the Petén areas and to the paleogeography of these and adjacent regions. Inasmuch as these matters will be treated in some detail in a forthcoming paper dealing with the herpetofauna of the Petén as a whole, only a few remarks seem necessary at this time.

With the exception of coastal areas, the very outer end of the peninsula, and extreme southern El Petén, the Yucatán Peninsula and Guatemala south to the foothills of Alta Verapaz have not been subjected to marine inundation since the Miocene, and there is some evidence that central El Petén has been continuously above the sea since the Cretaceous. Southern El Petén was inundated by an embayment that swung southward from Tabasco during the Pliocene, whereas extreme northern Yucatán and part of the coastal areas of Quintana Roo and Belice were subjected to Pleistocene flooding. Thus there was within this region an area of more than 100,000 sq. km. that could have served as a refuge for terrestrial organisms when adjacent areas were subjected to post-Miocene flooding and an area of possibly 40,000 sq. km. that could have served the same purpose during any period of post-Cretaceous inundation. Climatically, if I may be permitted to extrapolate from conditions on the North American mainland, there has been, with the exception of glacial stages, a gradual trend toward drier conditions since the Eocene. The Aftonian and Yarmouth interglacial periods may, indeed, have presented conditions no more humid than those of the present time. There is no herpetological evidence to suggest that other than tropical temperatures have prevailed in the lowlands of the region since the Eocene.

Like all of Middle America this general region received the first prototypes of its modern fauna from the north sometime prior to the mid-Eocene. A considerable portion of this fauna continued southward into South America to give rise to the South American Element of Dunn (1931) during the isolation of the southern continent in the mid-Eocene to Pliocene interval. Nevertheless, certain groups left stragglers behind in Middle America, notably representatives of the Gekkonidae, Iguanidae, and Colubridae. In Middle America these developed as the Autochthonous Middle American Element (Stuart, 1950). Shortly thereafter, a second faunal wave, the Old Northern Element of Dunn, moved into the region. These included representatives of such groups as the Plethodontidae, Kinosternidae, Dermatemyidae, Scincidae, and Microsauridae. These two faunal elements underwent evolution in Central America and Mexico during the mid-Eocene to Pliocene interval. There is evidence to suggest that certain modern genera evolved in the northern Central American region, notably the turtles *Claudius*, *Staurotypus*, and *Dermatemys*, the lizards *Laemantus*, *Corythophanes*, and parts of the genera *Anolis* and *Sceloporus*, as well as the snake genera *Coniophanes*, *Adelphicos*, and *Ficimia*. Since the Pliocene this autochthonous

fauna has been augmented by immigrants from the south (the South American Element of Dunn; for example, some of the hylids, *Ameiva* and *Constrictor*) as well as from the north (Dunn's younger Old Northern Element; for example, *Rana*, various scelopori, and *Elaphe*). During the periods of inundation in the peninsular area the older elements undoubtedly found refuge in the uplands immediately to the south which, prior to the Pliocene, were still low. Later, in the north during Pliocene inundation and possibly during the Pleistocene, the region of central El Petén and of the southern Yucatán Peninsula served as a refuge for all forms.

It appears that most of the genera now represented in this region were present at the opening of the Pleistocene. During that period differentiation into forms now characteristic of the drier environments of the outer end of the peninsula and into extant forms confined to the more mesic environments at the base of the peninsula and in southern El Petén was initiated. It is probable that many of the modern Yucatecan forms have differentiated very recently for a large number of them are poorly defined. In many instances they appear to have evolved from forms characteristic of the mesic Petén fauna. Insofar as the Uaxactún-Tikal area is concerned it is not improbable that during the period of maximum Wisconsin glaciation the herpetofauna of this region was larger than at present. In addition, a more or less uniform fauna may have been distributed throughout the peninsular and El Petén region. With the recession of the glaciers and the development of extant climatic differences to the north and south, some of the more mesic types withdrew to the south of the Uaxactún-Tikal area while others, under the influence of genetic drift, differentiated and became confined to the north. Present environmental conditions within the region have provided habitats for more southern mesic types than xeric northerners. If the climate continues its course toward more xeric conditions there may be a further recession of southern forms and an invasion of the region by additional Yucatecan elements.

SUMMARY

This investigation, based primarily upon collections made at Tikal in 1956 and to a lesser extent upon miscellaneous materials previously secured from Uaxactún, is presented as a type-study of the herpetofauna of the dry forest of northern El Petén, southern Campeche, and southern Quintana Roo.

The Uaxactún-Tikal area is situated in northeastern El Petén and is physiographically within the southeastern part of the Yucatán Peninsula. This region probably does not exceed 300 m. in elevation and presents a rolling, limestone surface which is poorly drained. It is subjected to high temperatures (mean annual about 27° C.) and receives relatively little precipitation (possibly 1800 mm. annually). It supports a cover of dry forest which is luxurious on the uplands but of a scrub nature in

depressions (*akalchés*). The area appears to represent a transition belt between the xeric scrub and thorn forest of outer Yucatán and the selva of southern El Petén.

The known herpetofauna comprises 64 species and subspecies divided among 50 genera. An examination of this herpetofaunal assemblage suggests that:

1. The herpetofauna of the region, though well balanced insofar as the major groups of reptiles and amphibians are concerned, is somewhat depauperate. This appears to be a result of the fact that although the region is relatively dry, it does present a high-forest habitat-type which precludes many savanna and scrub-forest forms. At the same time this forest is apparently too dry to permit the survival of many essentially southern, wet-forest species.

2. It is clear that the herpetofauna, though somewhat transitional in its composition, is more closely related to that of the Petén Biotic Area to the south than to the Yucatecan Biotic Area to the north. There is no faunal evidence to suggest that the dry-forest area of northern El Petén, southern Campeche, and southern Quintana Roo, as typified by the Uaxactún-Tikal area, is worthy of recognition as a distinct biotic area.

3. Within the area only a single major environment — the forest — exists. Microenvironments include the aquatic and aquatic-margin types and the several stories of the forest. An examination of the faunas of these microenvironments indicates that the herpetofauna of the region is essentially a high-forest assemblage.

4. The herpetofauna of the region is composed primarily of Old Northern and Autochthonous Middle American elements, many of which appear to have evolved *in situ* within this general area since mid-Eocene times. A few immigrants from the north and from the south seem to have entered the region since the Miocene.

APPENDIX: ANNOTATED LIST OF SPECIES

Bolitoglossa moreleti Smith

Tikal.

A single individual of this species was found in a rotten log by a workman cleaning the Great Plaza. Taylor and Smith (1945: 548) reported the species not uncommon at Piedras Negras, where it occurs in bromeliads during the dry season. The scarcity of large, vase-shaped bromeliads, the habitat of the species at Palenque in adjacent Mexico (and by inference at Piedras Negras), may explain why I did not secure more individuals at Tikal.

Rhinophrynus dorsalis Duméril and Bibron

Tikal.

All individuals of this species were secured from shallow cavities, not more than one or two inches beneath the ground surface. These were just large enough to accommodate the animal and had no visible opening to the surface. Most of the specimens were taken not far from the *aguada*.

Bufo valliceps Wiegmann

Tikal; Uaxactún.

Juveniles were secured beneath rubbish near the *aguada* at Tikal during the month of March; adults were distributed through the forest during the dry season. Evidently this species leaves the water immediately upon metamorphosing and remains under rubbish in the forest until the breeding season.

It is apparent that the forest has been too much of a barrier to permit *Bufo marinus* to penetrate to the water holes of this region.

Leptodactylus melanonotus Hallowell

Tikal.

Three specimens of this species were taken on the forest floor, one very late in the dry season. It was surprising to find this form, which is normally associated with running water, at Tikal; *Leptodactylus labialis*, which is more of a pond form, was not secured.

Syrrhophus leprus Cope

Tikal; Uaxactún.

A single specimen of this species from Tikal and two from Uaxactún indicate that this form is not too uncommon in the region. The individual from Tikal was found on the ground in the course of cleaning operations on the Great Plaza.

Eleutherodactylus rhodopsis Cope

Tikal.

At one time or another I have allocated a small, long-legged *Eleutherodactylus* from northern Central America variously to *rhodopsis* or *rostralis*. At the present time I am still undecided which name should be used, if, indeed, either. The materials I have examined do have a great deal in common with *rhodopsis*, and such differences as appear to exist are slight. Differences in pattern may accentuate the overall differences in the appearance of various populations. At one time I believed that the Guatemalan material belonged to the *gollmeri-noblei* series of lower Central America and South America, but these have small discs on the third and fourth toes, a feature not observed in my northern specimens. In order not to confuse the issue further, I retain *rhodopsis* for the Guatemalan population. One individual, a juvenile, is the sole representative of this species from the Uaxactún-Tikal area.

Hyla loquax Gaige and Stuart

Tikal.

Two individuals of this species were taken, one from the *aguada* at night and the other from the thatch of an old *champa* nearby.

Hyla microcephala martini Smith

Tikal.

Metamorphosing and recently metamorphosed individuals were taken from the *aguada* during the first half of March. Adults were secured there during March and early April.

Smilisca baudini Duméril and Bibron

Tikal; Uaxactún.

Tadpoles of this species were taken from the *aguada* at Tikal in mid-February and recently metamorphosed individuals were secured nearby during the first half of March. Juveniles were taken in the

forest not far from the *aguada* from early February through March. Half-grown individuals were also found in the forest from mid-March through mid-May, and adults were distributed through the forest during that period. These data indicate that juveniles migrate from the water soon after transforming and stray far into the forest during the dry season. Though several individuals were taken from palm fronds, the majority of the population appears to spend the dry season on the ground beneath rotting logs and other kinds of rubbish. Only one adult was secured from the *aguada* and this in late February.

Agalychnis callidryas Cope

Tikal.

Adults were taken at various times throughout the dry season. They were secured from fronds of the *botán* palm that had been gathered to be used for thatching. In early February an individual in the process of metamorphosing was secured from the *aguada* but toward the end of February juveniles lacking even tail-stubs were taken from the edges of the *aguada* and also in second growth well removed from the water.

Hypopachus cuneus nigroreticulatus Taylor

Tikal.

In late February juveniles of this species were found abroad at night along the edges of the *aguada*. Although an adult was occasionally found hopping about the forest trails at night, most of the adults were secured from shallow cavities in the earth where they were aestivating in the same manner as *Rhinophrynus dorsalis*.

Gastrophryne elegans Boulenger

Tikal.

Two individuals of this rare species were secured very early in the dry season. One was taken at night in muddy spot on a forest trail.

Rana pipiens Schreber

Tikal.

A population of some of the largest individuals (maximum head-body length, 117 mm.) of this species I have ever collected in Central America inhabited the *aguada* at Tikal. Large adults of this series have dark throats and chests and a tendency toward darkening on the undersides of the thighs and the lower legs.

Tadpoles were taken from the *aguada* between late February and late

April; a metamorphosing individual was secured late in April. A juvenile was found late in March. Unlike *Bufo valliceps* and *Smilisca baudini* this species does not stray far from water during the dry season.

[*Dermatemys mawii* Gray]

Uaxactún.

This species has been reported previously from Uaxactún on the basis of a carapace and plastron found in a burial urn in one of the temples (Stuart, 1934: 18). However, in going over the collection of this species in the Museum of Zoology, University of Michigan, I find that almost all individuals have, like *Staurotypus* (see comment about species which follows), been taken from clear lakes and streams, conditions which do not exist in the Uaxactún-Tikal area. I would now suggest, therefore, that the ceremonial individual was probably carried into Uaxactún from some other locale.

Claudius angustatus Cope

Tikal.

This species is here recorded from Guatemala for the first time. A series of several dozen individuals were taken from the *aguada*, where the form appeared to be more abundant than *Kinosternon leucostomum*. In view of material contained in the collections of the Museum of Zoology, University of Michigan, it seems possible that *Claudius* may be confined to small, muddy *aguadas* and may be replaced in clear lakes and rivers by *Staurotypus*. Certainly all specimens of the Museum's extensive collection of *Staurotypus* have been secured from clear water, whereas records indicate *Claudius* never has been.

Kinosternon leucostomum Duméril and Bibron

Tikal; Uaxactún.

Of the three species of *Kinosternon* known from the Petén, only this form has been secured in the Uaxactún-Tikal area. It was not uncommon in the *aguada* at Tikal.

[*Geoemyda areolata* Duméril and Bibron]

Uaxactún.

Like *Dermatemys* the basis of the Uaxactún record for this species is a plastron from a burial urn. The species is not, in my experience, a forest inhabitant. It may have been carried in from some other locale.

Pseudemys scripta ornata Gray

Tikal.

A small population of this form inhabited the *aguada*. As it is prized for food, it will probably not survive in the face of the large crew of workmen who will be stationed at the ruins.

Coleonyx elegans elegans Gray

Tikal; Uaxactún.

Several individuals of this species were found during the day hiding underneath rubbish in the forest; one specimen was taken crossing a forest trail at night.

Thecadactylus rapicaudus Houttyn

Tikal.

One individual was secured in a temple chamber.

Sphaerodactylus glaucus glaucus Cope

Tikal; Uaxactún.

Although *Sphaerodactylus lineolatus* was fairly common at Tikal, only a single individual of *glaucus* was secured there. Material from Uaxactún is about equally divided between the two forms.

Sphaerodactylus lineolatus Lichtenstein

Tikal; Uaxactún.

Although one specimen was secured within a temple chamber at Tikal, the majority were taken from the thatched roofs of the *champas*.

Anolis biporcatus Wiegmann

Tikal.

Five individuals of this species were secured. All were taken in the forest; three by workmen cutting the bush. Two are juveniles and two are only half-grown. One of the juveniles possesses the typical adult coloration; the other has the reticulate pattern of the juvenile. This is an arboreal species.

Anolis humilis uniformis Cope

Tikal; Uaxactún.

Although occasionally found on the ground, this little anole is most frequently encountered clinging to the trunks of trees or close to the ground on logs.

Anolis lemurinus bourgeaei Bocourt

Tikal; Uaxactún.

Although it is occasionally found not far above the ground on the trunks of trees, this form is essentially a ground-dweller. It was by far the most abundant reptile in the region. I had never before collected this form in so heavy a forest.

Anolis limifrons rodriguezi Bocourt

Tikal.

This anole shows a marked preference for shrubs and is generally found clinging to their outer branches. It occasionally takes to saplings and may climb a dozen feet above the ground.

Anolis pentaprion beckeri Boulenger

Tikal.

In a recent paper (Stuart, 1955: 4, 20) I placed *beckeri* in the synonymy of *Anolis pentaprion* Cope. I noted, however, that the northern population of this species may eventually be shown to be distinct, in which case the designation *beckeri* could be applied to this population. Although only one individual from Tikal has become available since that time, a reconsideration of my data leads me to believe that this northern population is indeed subspecifically distinct. In typical *pentaprion* the middorsal scutes on the tail are somewhat enlarged and heavily keeled to form a low, serrated crest. In *beckeri* these scales are reduced in size and but weakly keeled. Materials from the northern coast of Honduras appear to be intermediate in this unit character.

The individual from Tikal was taken from a small tree in camp. The specimen may have been brought in from the forest with some *botán* fronds to be used for thatching, which had been placed against this tree. In the Petén *beckeri* is known only from forested areas, and its short, stubby legs are strongly suggestive of climbing (i.e., arboreal) habits.

Anolis tropidonotus Wiegmann

Tikal; Uaxactún.

Found as frequently on the ground as on the trunks of trees close to the ground, this species occupies the microenvironment of both *Anolis lemurinus bourgeaei* and *Anolis humilis uniformis*.

Anolis ustus Cope

Tikal; Uaxactún.

This little species, like *Anolis limifrons rodriguezi*, is a shrub inhabitant and is generally encountered clinging to the ends of branches several feet above the ground.

Corythophanes cristatus Merrem

Tikal; Uaxactún.

Twelve individuals of this species were secured at Tikal. The majority of the specimens were brought in by workmen during the course of felling operations on the ruins and the same situation obtained with regard to *hernandezi*. I saw only two individuals of this genus during the course of my own wanderings through the forest. This indicates that both species live either in the forest-crown or very high in the taller trees. A juvenile was secured in early April.

Corythophanes hernandezi Wiegmann

Tikal.

Twenty-four individuals of this species were secured, indicating that this form is far more abundant in the dry forest than *cristatus*. A juvenile was obtained in mid-March.

Laemactus deborrei Boulenger

Tikal; Uaxactún.

The individual from Tikal was taken from the low *monte* surrounding the *aguada*. Neither this individual nor the one from Uaxactún shows any approach to *Laemactus waltersi* Schmidt described from Honduras.

Sceloporus lundelli lundelli Smith

Uaxactún.

I do not know this form in the field. Inasmuch as it extends

considerably farther south than Tikal, in British Honduras, I am unable to explain its absence from Tikal. It is probably an arboreal form.

Scincella cherriei ixbaac Stuart

Tikal; Uaxactún.

Four specimens from Tikal are somewhat intermediate between *ixbaac* and the typical form. Though all show the smaller number of scale rows around the body (28) that is typical of *ixbaac*, the number of dorsal scales between the parietals and the anus is somewhat higher than normal, ranging from 61 to 67. All individuals from Tikal were secured on the ground in the vicinity of the Great Plaza. It is unquestionably a mulch inhabitant.

Mabuya mabouya alliacea Cope

Tikal; Uaxactún.

Twenty-two individuals of a series of 25 from Tikal were taken in or near our camp or in the clearing surrounding it. They were found under rubbish and logs, in rotting stumps, and climbing on the *champas*. The remaining three were found on the ground in the course of cleaning operations on the Great Plaza. This suggests that *Mabuya*, unlike the *Scincella* of the deep forest, thrives best in *monte*-like conditions. A juvenile was secured in mid-May.

Eumeces schwartzei Fischer

Tikal; Uaxactún.

Eight specimens of this giant skink (including one preserved as a skeleton) were taken at Tikal. I observed only one specimen, which was sunning on a large log in a small clearing in the forest. The others were taken by workmen cleaning the ground on the Plaza Mayor of the ruins. The species is unquestionably a ground inhabitant. A half-grown individual was secured in early April.

Ameiva undulata gaigeae Smith and Lafe

Tikal; Uaxactún.

Of some 60 individuals collected at Tikal, only 4 are adult and the great majority are juveniles. The Gosner material from Uaxactún, on the other hand, contains a fine series of adults. Although this form occurs in the deep forest, especially along trails, at Tikal it was far more common in the clearing in which our camp was situated.

Celestus rozellae Smith

Tikal.

Two individuals of this rare species were found by workmen in the course of cleaning operations on the ruins. One, taken in early April, is only half-grown.

Constrictor constrictor imperator Daudin

Tikal.

A single individual of moderate size crawled into our camp early one evening apparently from the brush at the edge of the airstrip.

Scaphiodontophis carpicinctus Taylor and Smith

Tikal.

This is the second individual of this species (type locality, Piedras Negras, Guatemala) to be collected. It was found by a workman in the deep forest.

Ninia diademata nietoi Burger and Werler

Uaxactún.

A single individual, a paratype, of this recently described race was secured by Ricketson.

Ninia sebae morleyi Schmidt and Andrews

Tikal.

Sixteen specimens of this form were secured, mostly by workmen raking rubbish on the Great Plaza. Juveniles were taken in mid-March and early April. Although there is some indication of approach to the typical form, this series as a whole is definitely closest to the Yucatecan race. Eleven individuals are without dorsal dark spots; two are spotted; three display an intermediate condition.

Coniophanes imperialis clavatus Peters

Tikal; Uaxactún.

Thirteen individuals of this little cryptophile were secured. Most of them were found on the forest floor under rotting logs or rubbish. Two juveniles were taken between mid-February and early March; a female carrying three well-developed eggs was found in mid-May.

Coniophanes schmidti Bailey

Tikal.

Two individuals of this species which is nearly endemic to the Yucatán Peninsula were found by workmen during cleaning operations on the Great Plaza.

Xenodon mexicanus Smith

Tikal.

Four individuals were collected on the forest floor of the upland bush. Two of these specimens, taken in February, are somewhat less than half-grown.

Tropidodipsas sartori sartori Cope

Tikal; Uaxactún.

Of the three individuals secured, one is only half-grown and was taken in mid-March. Two were secured in the deep forest; the third crawled into our *champa* in camp from the surrounding second growth. The light bands on all three specimens were reddish orange in life.

Oxyrhopus petola aequifasciatus Werner

Tikal.

A single individual of this form was found by a workman during cleaning operations on the Great Plaza. I do not know its exact micro-environment.

Adelphicos quadrivirgatus visoninus Cope

Tikal.

A single individual of this little subspecies was found under some rotting vegetation at the edge of the *aguada*.

Drymobius margaritiferus margaritiferus Schlegel

Tikal.

This form is normally an aquatic-margin dweller, yet three of the five individuals secured were taken well within the forest far from water. Two were taken in the immediate vicinity of the *aguada*. Two were half-grown individuals captured in mid-March.

Dryadophis melanolomus, subsp.

Tikal.

Mr. Frank Smithe secured a single juvenile of this form. I observed several individuals of what may have been this species in the second growth bordering the airstrip, but I was unable to secure any. Inasmuch as the Smithe specimen has the typical juvenile pattern it is impossible to determine whether it should be assigned the northern Yucatán race, *melanolomus*, or the Alta Verapaz form, *laevis*. Central El Petén material from the La Libertad region is representative of an intergrade population.

Leptophis mexicanus mexicanus Duméril and Bibron

Uaxactún.

I am at a loss to explain the absence of this form from the Tikal collection, inasmuch as casual collecting at Uaxactún has produced three individuals.

Spilotes pullatus mexicanus Laurenti

Tikal.

Two large individuals and a half-grown specimen were secured from second growth at the edges of the airstrip.

Pseustes poecilonotus poecilonotus Günther

Tikal.

A single individual of this form was taken about five feet above the ground from a rotted stump of an *escoba* palm. When it was first sighted only its head and neck were protruding from a hole in the stump. Inasmuch as the stump was solid from the hole to the ground level, the snake must have attained this refuge by working its way up the spiny palm trunk. Although it measures 850 mm. in over-all length, the individual still retains the juvenile banded pattern in undiluted form.

Elaphe triaspis triaspis Cope

Uaxactún.

One specimen of this Yucatecan race was secured by Loomis.

Imantodes cenchoa leucomelas Cope

Tikal; Uaxactún.

Four individuals were secured by workmen in the course of felling

operations on the Great Plaza, which suggests that this subspecies is somewhat arboreal. However, a half-grown individual was found late in March on the ground beneath a rotting log. It had recently swallowed an *Anolis humilis uniformis*, which rarely ventures above the shrub level.

Leptodeira annulata polysticta Günther

Tikal.

This form appears to be as much at home in the arboreal habitat as on the ground. One individual was taken about 25 feet above the ground from an ant-infested bromeliad on a tree. A juvenile was secured in early March under a rotting log at the edge of the *aguada*.

Oxybelis aeneus aeneus Wagler

Tikal; Uaxactún.

Three individuals from Tikal all possess eyes that are slightly but definitely larger in diameter than internasal length. Bogert and Oliver (1945: 388) have shown that this is the situation in the typical population. Thus, contrary to their suggestion that the Yucatecan population may fall within the limits of the northern race *auratus*, the peninsular population should probably be included with the southern assemblage.

All individuals from Tikal were secured among the tall grasses, sedges, and hydrophile shrubs that were cut within the *aguada* as a water conservation measure. My experience with this form in Guatemala is rather extensive, and I have always associated it with scrub-forest or desert-shrub conditions. At Tikal only the brush of the *aguada* and possibly some of the scrubbiest parts of the *akalchés* appear to offer a suitable habitat for this snake.

Tantilla camula Cope

Tikal; Uaxactún.

Nine individuals, four from Tikal and five from the Uaxactún collection of Ricketson, about equal the number of previously known specimens. They add some information about the status of the unique type of *Tantilla breve* Günther from British Honduras. *Tantilla breve* was apparently described on the basis of lack of contact between the symphyseal and anterior chin shields, the reverse of the situation in *Tantilla camula*, which is obviously its closest relative. Smith (1942: 35) stated that this is a variable character in four Yucatecan individuals which he examined; in only one of the Tikal individuals does this lack of contact exist. Since there is some variation in this character as well as in the presence or absence of an anterior temporal, and since the ventral scutellation of

all of the available specimens falls in line, I believe that the use of the designation *breve* here might well be discontinued until such time as further material reveals the existence of two sibling populations.

One of the Tikal individuals was taken under a log in the forest and the three others were found on the forest floor by workmen clearing the ruins.

Tantilla moesta Günther

Tikal.

A single individual of this rare little cryptophile was found under a rotting log in the forest.

Ficimia publia publia Cope

Tikal.

A single individual was secured during cleaning operations on the Great Plaza, but I do not know whether it was secured on the ground or under forest litter.

Sibon dimidiata dimidiata Günther

Tikal.

Only one individual of this form was secured at Tikal as compared with a large series of *Sibon nebulata*. This indicates that *dimidiata* is something of a rarity in the region.

Sibon nebulata Linnaeus

Tikal.

Like *Leptodeira annulata polysticta* this snake is met as frequently in the trees as on the ground. In late February a male and a female were taken together in a *botán* palm. Between mid-March and mid-April a series of a dozen juveniles, certainly not many days old, were taken by workmen engaged in cleaning the Great Plaza. They were all, insofar as I could ascertain, taken on the ground or under forest litter. The entire series numbers 19.

Micrurus affinis alienus Werner

Tikal; Uaxactún.

The number of black bands on the body ranges from 24 to 29 (mean, 26) in the Tikal population of this species. Thus it shows no approach

to the Yucatecan *Micrurus affinis mayensis*. Six of the series of nine individuals were secured in the deep forest, whereas three were taken along the edge of the *aguada* at our camp.

Bothrops atrox asper Garman

Tikal; Uaxactún.

Early in the course of cleaning operations on the Great Plaza the workmen secured nine individuals of this form. Judging by their size, they all appeared to be from the previous year's clutch. Not until the operations had been almost completed were two very large adults, both over six feet in length, captured at the same locale.

Bothrops nasuta Bocourt

Tikal.

One young individual of this little species was secured under a rotting log in the forest.

Crocodylus moreleti Duméril and Duméril

Tikal; Uaxactún.

One medium-sized individual of this species inhabited the *aguada* at Tikal, and a crocodile, undoubtedly belonging to this common, inland-water form, is reliably reported from the water hole at Uaxactún. Neither the individual from the Tikal nor any from Uaxactún have been preserved.

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